

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

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**Listing of Claims:**

1. **(Currently amended):** A circuit to control the capacitance of a variable capacitor in a strictly linear mode through a steady tuning voltage and to achieve a high Q-factor at the same time; comprising:

~~means for a set of individual small capacitors;~~

5

~~means for a set of switching devices, to continually switch allowing a steady ramp-up/ramp-down phase between the points of being fully switched on and fully switched off, and where said switching devices are connected in series with said~~  
~~each capacitors of said set of capacitors, to connect a multiple of said capacitors in parallel;~~

10

~~means a set of circuits to linearly control the switching function operation in a ramp-up/ramp-down manner between the points of being fully switched on and fully switched off, for provided to each of said set of continuous-switching devices;~~

~~means for a set of translinear amplifier stages to produce said linear controls the ramp-up/ramp-down signal for each of said set of switching functions~~  
~~devices and implemented within said set of circuits to control the switching operation;~~

15

~~means a circuit to individually provide the threshold points for each individual capacitor switching stage; and~~

20

~~means a circuit~~ to provide a signal, dependent on the tuning voltage, dedicated for the voltage controlled capacitance change, to all of said translinear amplifier stages.

2. **(Currently amended):** The circuit of claim 1 wherein said switching device with steady transition phase is a FET transistor.

3. **(Currently amended):** The circuit of claim 2 wherein said switching device with steady transition phase is a P-MOS or N-MOS junction FET.

4. **(Currently amended):** The circuit of claim 2 wherein said switching device with steady transition phase is a CMOS FET.

5. **(Currently amended):** The circuit of claim 1 wherein said ~~means circuit~~ to individually provide said threshold points for each individual capacitor switching stage generates a set of reference values, one value for each capacitor switching stage.

6. **(Currently amended):** The circuit of claim 5 wherein said ~~means circuit~~ to generate a set of reference values, one for each of said translinear amplifier stages, is implemented as a chain of resistors.

7. **(Original):** The circuit of claim 1 wherein said translinear amplifier has a gain of 1, the typical gain of translinear amplifiers.
8. **(Original):** The circuit of claim 1 wherein said translinear amplifier has a gain differing from 1, which gives one more degree of freedom to optimize operating parameters, like overlapping of capacitor switching operation.
9. **(Currently amended):** The circuit of claim 1 wherein said ~~means~~circuit to provide a signal, dependent on the tuning voltage, dedicated for the voltage controlled capacitance change, is a single signal connected to all amplifier inputs.
10. **(Currently amended):** The circuit of claim 1 wherein the ~~means~~circuit to provide the output reference ~~signal~~level for the translinear amplifier, is a single signal connected to all translinear amplifier reference outputs.
11. **(Original):** The circuit of claim 1 wherein said capacitors are discrete capacitor components.
12. **(Currently amended):** The circuit of claim 1 wherein said capacitors are manufactured on a planar carrier, separate from the circuit carrier.

13. **(Original):** The circuit of claim 1 wherein said capacitors are integrated on a semiconductor substrate, but on a separate substrate than said switching devices and amplifiers.

14. **(Original):** The circuit of claim 1 wherein said capacitors are integrated on a semiconductor substrate and on the same substrate as said switching devices and amplifiers.

15. **(Original):** The circuit of claim 1 wherein said capacitors are manufactured as a Metal-Oxide structure.

16. **(Original):** The circuit of claim 1 wherein said capacitors are manufactured as a junction capacitor.

17. **(Currently amended):** A circuit to control the capacitance of a variable capacitor in a strictly linear mode through a steady tuning voltage and to achieve a high Q-factor at the same time by sharply cutting off the control signal, when said switching device is outside its dedicated active working steady transition area;  
comprising:

~~means for~~ a set of individual small capacitors;

~~means for~~ a set of switching devices to continually switch on allowing a steady ramp-up/ramp-down phase between the points of being fully switched on and fully switched off, and where said switching devices are connected in series

10 with said each capacitors of said set of capacitors, to connect a multiple of said capacitors in parallel;

~~means a set of circuits to linearly control the switching function operation in a ramp-up/ramp-down manner, for provided to each of said set of continuous switching devices, when as long as said switching device is operates in its~~  
 15 dedicated active working steady transition area, i.e. within the points of being fully switched on and fully switched off;

~~means a circuit to drive said switching device to a fully on status, when said switching device is outside its dedicated active workings~~  
 20 said steady transition area on the lower resistance side, and implemented within said set of circuits to control the switching operation.

~~means a circuit to drive said switching device to a fully off status, when said switching device is beyond its dedicated active workings~~  
said steady transition area on the higher resistance side, and implemented within said set of circuits to control the switching operation.

25 ~~means for a set of translinear amplifier stages to produce said linear controls the ramp-up/ramp-down signal for each of said set of switching devices,~~  
and implemented within said set of circuits to control the switching operation;

~~means a circuit to individually provide the threshold points for each~~  
 individual capacitor switching stage; and

30 ~~means a circuit to provide a signal, dependent on the tuning voltage,~~  
 dedicated for the voltage controlled capacitance change, to all of said translinear amplifier stages.

18. **(Currently amended):** The circuit of claim **17** wherein said ~~means~~circuit to drive said switching device to a fully-on status, when said switching device is outside its ~~dedicated active working~~desired steady transition area on the lower resistance side is provided by additional circuit elements, working as a signal-limiting function.

19. **(Currently amended):** The circuit of claim **17** wherein said ~~means~~a circuit to drive said switching device to a fully-off status, when said switching device is outside its ~~dedicated active working~~desired steady transition area on the higher resistance side is provided by additional circuit elements, working as a signal-limiting function.

20. **(Currently amended):** The circuit of claim **18** wherein said signal-limiting function to drive said switching device to a fully-on status, when said switching device is outside its ~~dedicated active working~~desired steady transition area on the lower resistance side, are implemented within the translinear amplifier circuit.

21. **(Currently amended):** The circuit of claim **19** wherein said signal-limiting function to drive said switching device to a fully-off status, when said switching device is outside its ~~dedicated active working~~desired steady transition area on the higher resistance side, are implemented within the translinear amplifier circuit.

22. **(Original):** The circuit of claim 17 wherein said translinear amplifier has a gain of 1, the typical gain of translinear amplifiers.

23. **(Currently amended):** The circuit of claim 17 wherein said translinear amplifier has a gain differing from 1, which gives one more degree of freedom to optimize operating parameters, like overlapping of capacitor switching operation and signal cut-off at the edges of the ~~dedicated active working~~steady transition area.

24. **(Cancelled):**

25. **(Cancelled):**

26. **(Currently amended):** A circuit to control the capacitance of a variable capacitor in a strictly linear mode through a steady tuning voltage and to achieve a high Q-factor at the same time and to compensate the temperature deviation of the capacitor switching device; comprising:

~~means for a set of individual small capacitors;~~

~~means for a set of switching devices to continually switch allowing a steady transition phase between the points of being fully switched on and fully switched off, and where said switching devices are connected in series with said on each capacitors of said set of capacitors to connect a multiple of said capacitors in parallel;~~

~~means a set of circuits to linearly control the switching function operation for~~  
each of said set of ~~continuous~~ switching devices, including a steady transition  
phase;

15 ~~means for a set of translinear amplifier stages to produce said linear~~  
~~controls signal for said switching functions devices, and implemented within said~~  
set of circuits to control the switching operation;

~~means a circuit to compensate the temperature deviation of said switching~~  
device;

20 ~~means a circuit to individually provide the threshold points for each~~  
individual capacitor switching stage; and

~~means a circuit to provide a signal, dependent on the tuning voltage,~~  
dedicated for the voltage controlled capacitance change, to all of said translinear  
amplifier stages.

27. **(Currently amended):** The circuit of claim **26** wherein said ~~means-circuit~~ to  
compensate the temperature deviation of said switching device is provided by  
feeding a modified reference voltage to said translinear amplifier's output  
reference point, to mirror a temperature correcting signal into the control signal of  
5 said switching device.

28. **(Currently amended):** The circuit of claim **27** wherein said ~~means-circuit~~ to  
compensate the temperature deviation of said switching device, uses a device of



the same type as said switching device itself, to produce an exact equivalent of said temperature deviation.

29. **(Currently amended):** A circuit to control the capacitance of a variable capacitor ~~in with~~ a steady mode, but with predefined non-linear relation to the tuning voltage, through a steady tuning voltage and to achieve a high Q-factor at the same time; comprising:

5            ~~means for~~ a set of individual small capacitors;

~~means for~~ a set of switching devices ~~to continually switch allowing a steady~~  
             ramp-up/ramp-down phase between the points of being fully switched on and fully  
             switched off, and where said switching devices are connected in series with said  
             capacitors of said set of capacitors, to connect a multiple of said capacitors in  
10           parallel;

~~means a set of circuit to linearly control the switching function operation in a~~  
             ramp-up/ramp-down manner between the points of being fully switched on and  
             fully switched off, for provided to each of said set of continuous-switching devices;

~~means for~~ a set of translinear amplifier stages to produce said linear  
15           ~~controls the ramp-up/ramp-down signal for each of said set of continuous~~  
             switching devices, and implemented within said set of circuits to control the  
             switching operation;

~~means a circuit to~~ individually provide the threshold points for each  
             individual capacitor switching stage;

20            ~~means a circuit~~ to provide a signal, dependent on the tuning voltage,  
dedicated for the voltage controlled capacitance change, to all of said translinear  
amplifier stages and;

~~means a circuit~~ to provide a non-linear relation between said tuning voltage  
and said threshold points.

30. **(Currently amended):** The circuit of claim **29** wherein said ~~means circuit~~ to  
individually provide said threshold points for each individual capacitor switching  
stage generates a set of reference values, one value for each capacitor switching  
stage.

31. **(Currently amended):** The circuit of claim **29** wherein said ~~means a circuit~~ to  
provide a non-linear relation between said tuning voltage and said threshold points  
is provided by specifically selecting the steps of ~~said set of reference values~~ in a  
way, to achieve said desired non-linear relation.

32. **(Currently amended):** The circuit of claim **30** wherein said ~~means circuit~~ to  
generate a set of reference values, one for each of said translinear amplifier  
stages, is implemented as a chain of resistors.

33. **(Currently amended):** A method to control the capacitance of a variable  
capacitor in a strictly linear mode through a tuning voltage and to achieve a high  
Q-factor at the same time; comprising:

providing ~~means for a set of individual small capacitors, means for a set of~~  
5 ~~switching devices to continually switch allowing a steady ramp-up/ramp-down~~  
~~phase between the points of being fully switched on and fully switched off, and~~  
~~where said switching devices are connected in series with said~~ ~~each capacitors~~  
~~of said set of capacitors, to connect a multiple of said capacitors in parallel,~~  
~~means a set of circuits to linearly control the switching function operation in a~~  
10 ~~ramp-up/ramp-down manner between the points of being fully switched on and~~  
~~fully switched off, provided to for each of said set of continuous-switching devices,~~  
~~means for a set of translinear amplifier stages to produce said linear controls~~  
~~signal for said ramp-up/ramp-down switching, operation, means to linearly control~~  
~~said switching function for each of said set of continuous-switching devices,~~  
15 ~~means a circuit to individually provide the threshold points for each individual~~  
~~capacitor switching stage, means a circuit to provide a signal, dependent on the~~  
~~tuning voltage, dedicated for the voltage controlled capacitance change, to all of~~  
~~said translinear amplifier stages;~~

~~continually fully switching on one of said continuous-switching devices in~~  
20 ~~order to completely switch one of said small capacitors in parallel to the already~~  
~~switched on capacitors, one after the other;~~

~~fully switching off one of said switching devices in order to completely~~  
~~disconnect one of said small capacitors from the other switched on capacitors, one~~  
~~after the other;~~

25 ~~linearly ramping up or ramping down controlling the switching function~~  
~~operation for each of one of said continuous-switching devices to partially switch,~~

with increasing/decreasing share, one of said small capacitors in parallel to the already switched on capacitors, one after the other;

30       amplifying, by the means of a translinear amplifier, the difference of the capacitance tuning voltage and the threshold points of each amplifier stage to produce the linear control signal for said ~~continually-ramp-up/ramp-down~~ switching operation;

      providing said threshold points for each individual capacitor switching stage; and

35       supplying a signal, dependent on the tuning voltage, dedicated for the voltage controlled capacitance change, to all of said translinear amplifier stages.

34. **(Currently amended):** The method of claim **33** wherein linearly controlling the switching operation applies to a FET transistor as ~~said the switching device~~ with steady transition phase.

35. **(Currently amended):** The method of claim **34** wherein linearly controlling the switching operation applies to a P-MOS or N-MOS junction FET as said ~~continuous-switching device~~ with steady transition phase.

36. **(Currently amended):** The method of claim **34** wherein linearly controlling the switching operation applies to a P-channel or N-channel CMOS FET as said ~~continuous-switching device~~ with steady transition phase.

37. **(Original):** The method of claim **33** wherein individually providing said threshold points for each individual capacitor switching stage generates a set of reference values, one value for each capacitor switching stage.

38. **(Original):** The method of claim **37** wherein generating a set of reference values, one for each of said translinear amplifier stages, is performed by a chain of resistors.

39. **(Original):** The method of claim **33** wherein continually switching on one of said small capacitors in parallel to the already switched on capacitors applies to discrete capacitor components.

40. **(Currently amended):** The method of claim **33** wherein continually switching on one of said small capacitors in parallel to the already switched on capacitors applies to capacitors manufactured on a planar carrier, separate from the circuit carrier.

5      41. **(Original):** The method of claim **33** wherein continually switching on one of said small capacitors in parallel to the already switched on capacitors applies to capacitors integrated on a semiconductor substrate.

42. **(Original):** The method of claim 33 wherein supplying a tuning voltage, dedicated for the voltage controlled capacitance change, to all of said translinear amplifier stages uses a single signal connected to all amplifier inputs.

43. **(Currently amended):** A method to control the capacitance of a variable capacitor in a strictly linear mode through a tuning voltage and to achieve a high Q-factor at the same time by sharply cutting off the control signal, when said switching device is outside its ~~dedicated active working~~steady transition area; comprising:

providing ~~means for a set of individual small capacitors, means for a set of switching devices to continually switch allowing a steady ramp-up/ramp-down phase between the points of being fully switched on and fully switched off, and where said switching devices are connected in series with on said capacitors in parallel, one for each of said small capacitors, means a set of circuits to linearly control the switching function operation in a ramp-up/ramp-down manner between the points of being fully switched on and fully switched off, provided to for each of said continuous switching devices, when said switching device is in its dedicated active working area, means a circuit to overdrive said switching device to a fully-on status, when said switching device is outside its dedicated active working~~steady transition area on the lower resistance side, ~~means a circuit to overdrive said switching device to a fully-off status, when said switching device is beyond its dedicated active working~~steady transition area on the higher resistance side, ~~means for a set of translinear amplifier stages to produce said linear controls~~

20 signal for said switching functions, ~~means a circuit~~ to individually provide the  
threshold points for each individual capacitor switching stage, ~~means a circuit~~ to  
provide a signal, dependent on the tuning voltage, dedicated for the voltage  
controlled capacitance change, to all of said translinear amplifier stages;  
~~continually~~ steadily ramp-up/ramp-down switching on one of said  
25 ~~continuous~~ switching devices in order to partially switch, with  
increasing/decreasing share, one of said small capacitors in parallel to the already  
switched on capacitors, one after the other;  
linearly controlling the switching function for each of said ~~continuous~~  
switching devices, when said switching device is in its ~~dedicated active~~  
30 ~~working~~ steady transition area;  
driving said switching device to a fully on status, when said switching device  
is outside its ~~dedicated active working~~ steady transition area on the lower  
resistance side;  
driving said switching device to a fully off status, when said switching device  
35 is beyond its ~~dedicated active working~~ steady transition area on the higher  
resistance side;  
amplifying, by the means of a translinear amplifier, the difference of the  
capacitance tuning voltage and the threshold points of each amplifier stage to  
produce the linear control signal for said ~~continually~~ switching operation;  
40 providing said threshold points for each individual capacitor switching stage;  
and

supplying a signal, dependent on the tuning voltage, dedicated for the voltage controlled capacitance change, to all of said translinear amplifier stages.

**44. (Currently amended):** The method of claim **43** wherein driving said switching device to a fully-on status, when said switching device is outside its ~~dedicated active-working~~desired steady transition area on the lower resistance side uses additional circuit elements, working as a signal-limiting function.

**45. (Currently amended):** The method of claim **43** wherein driving said switching device to a fully-off status, when said switching device is outside its ~~dedicated active-working~~steady transition area on the higher resistance side uses additional circuit elements, working as a signal-limiting function.

**46. (Currently amended):** The method of claim **44** wherein said signal-limiting operation to drive said switching device to a fully-on status, when said switching device is outside its ~~dedicated active-working~~steady transition area on the lower resistance is implemented within the translinear amplifier.

**47. (Currently amended):** A method to control the capacitance of a variable capacitor in a strictly linear mode through a tuning voltage and to achieve a high Q-factor at the same time and to compensate the temperature deviation of the capacitor switching device; comprising:



5            providing ~~means for a set of individual small capacitors, means for a set of~~  
switching devices with steady transition phase to continually switch on said  
capacitors in parallel, ~~means for a set of translinear amplifier stages to produce~~  
said linear controls for said switching functions, ~~means a circuit~~ to linearly control  
the switching function for each of said ~~continuous-switching devices~~ with steady  
10    transition phase, ~~means a circuit~~ to compensate the temperature deviation of said  
switching device, ~~means a circuit~~ to individually provide the threshold points for  
each individual capacitor switching stage, ~~means a circuit~~ to provide a signal,  
dependent on the tuning voltage, dedicated for the voltage controlled capacitance  
change, to all of said translinear amplifier stages;

15            continually switching on one of said ~~continuous-switching devices~~ with  
steady transition phase in order to switch one of said small capacitors in parallel to  
the already switched on capacitors, one after the other;

             linearly controlling the switching function for each of said ~~continuous~~  
switching devices with steady transition phase;

20            compensating the temperature deviation of said switching;

             amplifying, by ~~the means of a translinear amplifier~~, the difference of the  
capacitance tuning voltage and the threshold points of each amplifier stage to  
produce the linear control signal for said continually switching operation;

             providing said threshold points for each individual capacitor switching stage;

25            and

             supplying a signal, dependent on the tuning voltage, dedicated for the  
voltage controlled capacitance change, to all of said translinear amplifier stages.

48. **(Original):** The method of claim 47 wherein compensating the temperature deviation of said switching device is provided by feeding a modified reference voltage to said translinear amplifier's output reference point, to mirror a temperature correcting signal into the control signal of said switching device.

49. **(Original):** The method of claim 48 compensating the temperature deviation of said switching device, uses a device of the same type as said switching device itself, to produce an exact equivalent of said temperature deviation.

50. **(Currently amended):** A method to control the capacitance of a variable capacitor in a steady-mode, but with predefined non-linear relation to the tuning voltage, through a tuning voltage and to achieve a high Q-factor at the same time; comprising:

5           providing ~~means for~~ a set of individual small capacitors, ~~means for~~ a set of  
switching devices with steady transition phase to continually switch on said  
capacitors in parallel, ~~means a circuit~~ to linearly control the switching function for  
each of said ~~continuous~~ switching devices with steady transition phase, ~~means for~~  
a set of translinear amplifier stages to produce said linear controls for said  
10   switching functions, ~~means a circuit~~ to individually provide the threshold points for  
each individual capacitor switching stage, ~~means a circuit~~ to provide a signal,  
dependent on the tuning voltage, dedicated for the voltage controlled capacitance  
change, to all of said translinear amplifier stages;

continually switching on one of said ~~continuous~~ switching devices with  
15 steady transition phase in order to switch one of said small capacitors in parallel to  
the already switched on capacitors, one after the other;

linearly controlling the switching function for each of said ~~continuous~~  
switching devices with steady transition phase;

amplifying, by ~~the means of~~ a translinear amplifier, the difference of the  
20 capacitance tuning voltage and the threshold points of each amplifier stage to  
produce the linear control signal for said continually switching operation;

providing said threshold points for each individual capacitor switching stage,  
producing non-linear instead of linear steps;

supplying a signal, dependent on the tuning voltage, dedicated for the  
25 voltage controlled capacitance change, to all of said translinear amplifier stages;  
and

providing a non-linear relation between said tuning voltage and said  
threshold points.

51. **(Original):** The method of claim **50** wherein individually providing said  
threshold points for each individual capacitor switching stage generates a set of  
reference values, one value for each capacitor switching stage.

52. **(Original):** The method of claim **50** wherein providing a non-linear relation  
between said tuning voltage and said threshold points is provided by specifically

selecting the steps of said set of reference values in a way, to achieve said  
desired non-linear relation.